

# MARINE REVIEW.

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## Ship Building Summary.

THIRTY SHIPS VALUED AT \$4,806,000 UNDER CONTRACT IN LAKE YARDS  
—NEW FREIGHT VESSELS WILL CARRY, NEXT SEASON,  
1,476,000 TONS ON 14 FEET DRAFT.

A summary of new ships, which are now actually under way in lake yards, foots up a total of thirty, the aggregate value of which is \$4,806,000. Vessel owners and shippers will be interested in knowing that the freight-carrying vessels in the list number twenty-five, and on the present draft at St. Mary's Falls canal these ships will carry during the season of 1896 full 1,476,000 gross tons.

Of the twenty-five freight vessels under contract, twelve are steel steamers of the very largest class; four are modern steel tow barges of 4,000 gross tons capacity on 14 feet draft; three are wooden steamers and six are wooden tow barges. Of the five other vessels, all of which are steel, two are side-wheel passenger steamers and three are steam yachts.

Estimates as to the season's capacity of the vessels are based on not more than twenty-two trips for the steamers that will run without consorts and not more than eighteen trips for the consorts. These extremes as to the number of trips were used in cases where it is reasonable to expect that the vessels will be given better dispatch than is ordinarily secured in the ore trade. The list of new vessels under way, with approximate valuations and estimated capacity for the full season, follows:

	Capacity for full season, gross tons, Lake Superior draft.	Valuation, approximate
<b>F. W. WHEELER &amp; CO., WEST BAY CITY, MICH.—</b>		
386-foot steel steamer for Eddy Bros., West Bay City, Mich.....	73,000	\$225,000
400-foot steel steamer for Dr. Roby and others, Detroit, Mich.....	80,000	250,000
386-foot steel steamer for D. C. Whitney, Detroit, Mich.....	73,000	225,000
386-foot steel steamer for John Mitchell, Cleveland, O.....	73,000	225,000
<b>CHICAGO SHIP BUILDING CO., SOUTH CHICAGO, ILL.—</b>		
375-foot steel steamer for C. W. Elphicke & Co., Chicago.....	66,000	230,000
Steel tow barge for Minnesota Steamship Co., Cleveland.....	72,000	145,000
Steel tow barge for Minnesota Steamship Co., Cleveland.....	72,000	145,000
Steel tow barge for Northwestern Trans. Co., Detroit, Mich.....	72,000	145,000
<b>DETROIT DRY DOCK CO., DETROIT, MICH.—</b>		
Side-wheel steel passenger Steamer for Cleveland & Buffalo Transit Co., Cleveland.....		350,000
400-foot steel steamer for M. W. Humphrey and others, Detroit.....	81,000	260,000
Steel lumber-carrying steamer for C. R. Jones & Co., Cleveland.....	38,000	140,000
<b>CLEVELAND SHIP BUILDING CO., CLEVELAND, O.—</b>		
400-foot steel steamer for Wilson Transit Co., Cleveland.....	80,000	250,000
413-foot steel steamer for Zenith Transit Co., Duluth, Minn.....	83,000	260,000
<b>GLOBE IRON WORKS CO., CLEVELAND, O.—</b>		
415-foot steel steamer for Mutual Trans. Co., Cleveland.....	84,000	270,000
Steel revenue cutter for United States treasury department.....		147,000
<b>AMERICAN STEEL BARGE CO., WEST SUPERIOR, WIS.—</b>		
380-foot steel steamer for American Steel Barge Co.....	67,000	225,000
360-foot steel barge for American Steel Barge Co.....	72,000	160,000
<b>UNION DRY DOCK CO., BUFFALO, N.Y.—</b>		
315-foot steel package-freighter for builders' account.....	58,000	180,000
Steel steam yacht for W. J. Connors, Buffalo.....		65,000
<b>JAMES DAVIDSON, WEST BAY CITY, MICH.—</b>		
Wooden steamer, about size of Rappahannock, builders' account...	46,000	145,000
Open deck wooden steamer, about size Madagascar, builders' acc't	35,000	80,000
Wooden consort, builders' account.....	45,000	85,000
Wooden consort, builders' account.....	45,000	85,000
Wooden consort, builders' account.....	45,000	85,000
<b>ALEX. ANDERSON, MARINE CITY, MICH.—</b>		
Wooden tow barge for Connolly Bros., Buffalo.....	22,000	32,000
<b>ABRAM SMITH &amp; SONS., ALGONAC, MICH.—</b>		
Wooden tow barge, builders' account.....	22,000	32,000
<b>SIMON LANGELL, ST. CLAIR, MICH.—</b>		
Wooden tow barge, builders' account.....	36,000	45,000
<b>JENKS SHIP BUILDING CO., PORT HURON, MICH.—</b>		
Wooden steamer, 254 feet over all.....	36,000	80,000
<b>BERTRAM ENGINE WORKS, TORONTO, ONT.—</b>		
285-foot steel passenger steamer for Niagara Nav. Co., Toronto.....		175,000
<b>RACINE BOAT M'N'F'G. CO., RACINE, WIS.—</b>		
140-foot steel steam yacht for F. W. Morgan, Chicago.....		65,000
Total.....	1,476,000	\$4,806,000

Negotiations for one or two car ferries and several steel steamers and consorts, which are now under way, will result in a few more contracts being let, but few, if any, of these vessels can be gotten out before July or August of next year.

## To Break all Records in Moving Ore.

No ship in this or any other country has ever been credited with moving as much freight in a year as will be moved in about seven months, next season, in the big steel steamer which the Mutual Transportation Co. of Cleveland purchased, a few days ago, from the Globe Iron Works Co. This vessel is to engage in the ore trade between Escanaba and Ashtabula, exclusively, taking no cargoes on return trips to Lake Michigan, and it is absolutely certain, barring accident, that she will make thirty round trips, covering 1,178 miles on each trip, and delivering on inside calculations 150,000 tons of ore of 2,240 pounds each.

But this is allowing about seven days to a trip, although all vessels of the Mutual line, engaged in the same trade this season, have been making five-day trips. One of them, the Cambria, will make thirty-seven and possibly thirty-eight trips this season. She was loaded at Escanaba seven times during the month of August, taking on one cargo on the first day of the month and another on the 31st.

The calculations of the owners of the new boat, who control mines and docks, and whose influence with the railways at both ends of the route is equally important, are to have ore always ready for the big steamer, loading her in a few hours, and unloading her, as is now the case with the smaller steamers, in a day. If this latter aim is accomplished, it would not be surprising to learn at the close of next season that the new steamer's record of ore delivered at Ashtabula is nearer to 185,000 tons than 150,000.

At Ashtabula a dock that is being prepared with a view to giving this vessel special dispatch will be equipped with ten rigs for hoisting ore, and if possible the number of these machines will be increased to twelve to correspond with the number of working hatches in the ship. But this is not all that is in favor of an enormous record for the vessel in the Escanaba trade. It is quite probable that there will be 17 feet of water available in the trade between Escanaba and Ashtabula next season. This may seem like an exaggerated statement, in view of the low water that has prevailed during the season now drawing to a close, but the best information that can be obtained from government engineers at Detroit is to the effect that parts of the 20-foot channel work at the foot of Lake Huron, at Grosse point, and at the mouth of the Detroit river, which will be of advantage to vessels in the Lake Michigan trade, are so near completion that a draft of 17 feet throughout the rivers from Lake Huron to Lake Erie will be available shortly after the opening of navigation next season. Of course the war department may object to these channels being used until the last sweeping of them is at an end, but it is thought that this objection can be overcome when the benefits to be derived from early use of the channels are explained. At Ashtabula two or three dredges are now at work preparing for the new condition of things, and it is expected that at that point also there will be a narrow channel of full 17 feet shortly after the opening of the season.

Chief Naval Constructor Hichborn again makes a plea to congress, in his annual report, for an appropriation for an experimental tank, in which to test models of war vessels. It is certainly time that congress should grant this request of the navy department. All other governments that maintain a navy of any importance have a tank of this kind. The report sent out from Brooklyn a short time ago to the effect that an experimental tank was being constructed at the navy yard there was unfounded. It was prompted by some scientific experiments that were being made on a small scale.

The bureau of steam engineering, navy department, which has obtained on the lakes reports from Belleville water tube boilers in the passenger steamer North West and Babcock & Wilcox water tube boilers in the freight steamer Zenith City, is said to be better pleased with the latter type of boiler than with the Belleville, and it is now quite certain that the Babcock & Wilcox generators will be used in three of the six composite gunboats, for which contracts were let a few days ago.

It is quite generally admitted that the Nicaragua canal commission made a favorable report as to the feasibility of the canal project from an engineering standpoint, but suggested a number of important changes. The estimate of the commission as to the cost of construction is a matter of considerable gossip and it has been generally placed between \$110,000,000 and \$150,000,000.



### Regulating Lake Levels.

In the REVIEW of Sept. 26 there was printed a paper by Geo. Y. Wisner of Detroit, on the "Regulation of Lake Levels with Reference to Improving Waterways." This was one of a large number of important papers presented at the first annual meeting of the International Deep Waterways Association in Cleveland recently. Supplemental to Mr. Wisner's paper we now print another paper on the subject by Thomas T. Johnston, C. E., assistant chief engineer of the Chicago drainage canal. Mr. Johnston's contribution is really a discussion of the paper presented by Mr. Wisner.

### Regulating Levels of the Great Lakes.

THOMAS T. JOHNSTON, C. E.,

Assistant Chief Engineer Chicago Sanitary and Ship Canal, Chicago.

There has been presented the outline of a scheme for regulating and controlling the levels of Lakes Erie, Huron, Michigan and Superior by means of the combined influence of dams across the Niagara River and across the St. Mary's River. Statements have been made of how many feet the levels of these lakes ordinarily change. There are long periods when boats plying between certain harbors may be loaded to a depth of twenty feet, and equally long periods when the same boats plying between the same harbors cannot be loaded to a depth of sixteen feet. Such a period as the latter now has existence. It is interesting and useful, therefore, to note that almost every newspaper in the United States and Canada and many in foreign lands, almost every statesman in these same countries, and almost every commercial man, financier, manufacturer and agriculturist, at this time and for some months, has been concerned more or less deeply in a possible change of three to six inches in the permanent levels of several of the lakes. How much more important should be the interest in changes of three to six feet—changes just twelve times as great!

Statements have been made that the ordinary changes of level in Lake Erie may be reduced from five feet to one foot; that the low water depth of that lake may be permanently increased about four feet; that Lakes Michigan, Huron and Superior can be affected in essentially the same degree; that the tortuous channels connecting Huron and Erie can be improved in corresponding degree or rendered more tractable to improvement; that the dams projected will accomplish all these things. Statements have been made that certain investigations are desirable in order to arrange the minor details of these constructions to the best advantage; that the rain-falls vary more or less; that evaporation is more at one time than at another; that vegetation is a factor in the problem by its variable absorption of water; that certain canals and water powers and channel excavations have an influence. Statement has been made, and it is of more importance at the present time than all the others put together, that the question is of an international character; that Canada on the one hand and the United States on the other, have interests involved. This community of interest is the greatest obstacle opposed to accomplishing the end desired, at once.

The practicability of the project and the utility of its execution are the broad ideas of concern, and it may be useful to consider them from an engineering point of view. It is from an understanding of them that tangible results will be derived.

The practicability of the project has three elements:

First.—The quieting of legal points.

Second.—The finances.

Third.—The engineering merits of the matter.

The legal points are mainly involved in international features, all else being a question of legislation and damages. The international questions growing out of the use of the great lakes are multitudinous in the extreme and have confronted the engineer more than once, and in several instances the rights of one nation or the other have been ignored in making use of the waters of these lakes. Nearly fifty years ago Chicago began to divert the waters of the lakes into the Mississippi valley. Canada has for many years maintained a canal around Niagara Falls, and both nations now unnaturally drain Lake Superior through canals and locks.

It is worth while to dwell for a moment on the state of affairs at Sault Ste. Marie. There are three enormous structures at that place called locks, and two ship canals to enable not only boats but also water to gain access to the locks. Not only an immense tonnage of shipping passes through these locks but also an immense quantity of water. No one will doubt but that in the near future, at least, these locks will be taxed to their utmost capacity to pass the shipping coming to them. This means the passage through these locks, when operated once every 20 minutes, of nearly 200,000 cubic feet per minute, or about 60 per cent. as much water as Chicago now proposes to drain from the vastly larger volume of Lakes Michigan, Huron and Superior combined.

The facilities for outflow from Superior have been vastly increased by these locks, and between 2 and 3 per cent. of its average outflow can, and doubtless will, flow through them.

An extensive waterpower project is in existence to be located at this place, the effect of which will be to still further facilitate flow from

Superior. The effect of this unnatural drainage will be to lower the lake permanently. The total flow from the lake will not be increased, but less water will flow over the rapids and the rest through the locks and water wheels.

Since less water is to flow over the rapids there will be less depth of water there, and consequently a lower lake level.

The remedy for this evil is, of course, very simple, being the construction of a dam and sluices at the head of the rapids at a cost that will be of no moment.

As in the past, so in the future; still further liberties may be expected to be taken with the international rights involved in the use of the waters of the lakes, except that those uses are becoming so numerous that the nations may determine to place some restraint on those liberties.

The engineer has had under consideration for many years the problems of improving the navigable depth of the lakes and their harbors, and has reflected upon the vast advantages to be gained. But he has been compelled to shrink from such an undertaking, not because of any physical conditions confronting him, but because he could see no way to overcome the international questions involved. Here has been an insuperable obstacle,

On the one hand there has not been time to overcome it, and on the other there have not been enough interests at stake to set the necessary forces at work even if time permitted. The time seems at hand when great works are to be undertaken for operating deep water navigation from the lakes to the ocean, but the operations of the engineers will be completely blocked until the international questions are quieted. Once clear away this obstacle and the rest will follow.

The work on the lakes will become a parallel to those now in progress on the Mississippi river. This parallel is worth examination in further detail. The United States government has for many years been expending money to improve the Mississippi river. Prior to 1880 the expenditures were confined to local improvements just as is now the case on the great lakes. About that time, as an outgrowth of conventions similar to this and of the engineering views which had developed, it was determined that the improvement of the river as a whole was the proper and useful thing to undertake. Congress created a commission for that purpose and has since appropriated many millions for its uses.

In the brief period of fifteen years so much money has been expended on the comprehensive improvement of the Mississippi, that if it had been applied to the great lakes it would have made a ship canal around Niagara, or twice over regulated lake levels to the fullest extent possible, or would have accomplished a large part of a ship channel from Lake Ontario to the Hudson.

Does any one believe these things would have had existence if the Mississippi had been the boundary line between two nations?

Compare the commerce of the Mississippi with that of the great lakes. Consider the vastly greater interests on the lakes. If the lakes stood in the same relation to the United States that the Mississippi does, would there be any doubt about the United States taking equal interest in their improvement and development?

Private corporations can bring the two nations together when the question of terminating a bridge on the opposite shore is in controversy. Why not a similar arrangement when the question in hand is the construction of a dam? This convention can usefully urge the quieting of the international questions; and, considering the state of affairs at the mouth of Lake Superior and elsewhere, the time is ripe for action.

As far as the practicability of lake level regulation is dependent on legislation and damages, little need be said. Legislation on matters relating to improvements of navigable depths is amply abundant, and if lake levels be confined to their ordinary bounds no serious damage can result compared with benefits to be derived.

Practicability, as far as finances are concerned, can not be questioned. It is only necessary to make the project for lake improvement popular in order to secure the money for the work. It requires no greater annual expenditure than is now made for the Mississippi river in order to progressively prosecute a deep-water project through the great lakes to the Atlantic.

Practicability from an engineering point of view is even more certain than from a financial or legal view. There are delegates to this convention who are reconciled to the practicability of a bridge at New York, the supported ends of which are to be distant one from the other more than 3,000 feet. There are those who have witnessed the excavation of a great canal at Chicago, for the greater part with machines that were unknown five years ago, with a rapidity exceeding the expectations of the most sanguine of its projectors and at a cost much less than had been supposed possible a short time since. There are those who have seen the torrential floods of Wisconsin rivers rendered obedient to a gate-keeper's will so that so much water should pass at one place and so much at another.

Mechanical progress is taking place at rapid pace, and every confidence may be had that if the engineering difficulties be alone to be overcome, then the work is as good as done.

Of course there are, and will be, negative minds which will send forth



objections and warnings, just as was the case with the works at the mouth of the Mississippi, or the Chicago Drainage Canal; but who can recall a case wherein the objections and warnings have not proved absurd?

The steamboat, the locomotive and the steamship have all survived in spite of the negations of their birth-time.

The utility of executing a project for regulating and controlling the levels of lakes may be measured in several ways, according to the point of view. Those commercially inclined will inquire as to the revenue to be derived from the investment, either directly or indirectly, or as to the effect on freight rates. The ship owner will inquire as to how many tons of freight he can carry in one hull. The engineer will inquire into the physical effect of the work, not only with reference to what he creates, but as to what he preserves.

The regulation will secure an increase of low water navigable depths in the several lakes affected to the amount of several feet, besides rendering the depths at all times more nearly uniform, and thereby enabling ships at all times to carry nearly full cargoes. This constitutes the utility with reference to what is created. The utility with reference to what is preserved may be far more important.

It is a fact that the hydraulic conditions in the basin of the upper lakes, especially, are and have been undergoing a change, the effect of which is not determined and may never be. The forests are giving away to farms. The proportion of rainfall absorbed by vegetation is perhaps widely different from what it was formerly, and just to the extent that the farm has displaced the forest, to just such extent has there been an increase in the quantity of water used. Again, the disappearance of the forest may be accompanied by change of rainfall, or in the proportion of rainfall that finds its way to the lakes rather than to the skies by evaporation. Again, conditions such as exist at the Sault Ste. Marie are having a prejudicial effect on Lake Superior. In fact, the tendency of works now being executed in the St. Clair flats, Detroit and Niagara rivers and at Chicago, and the works

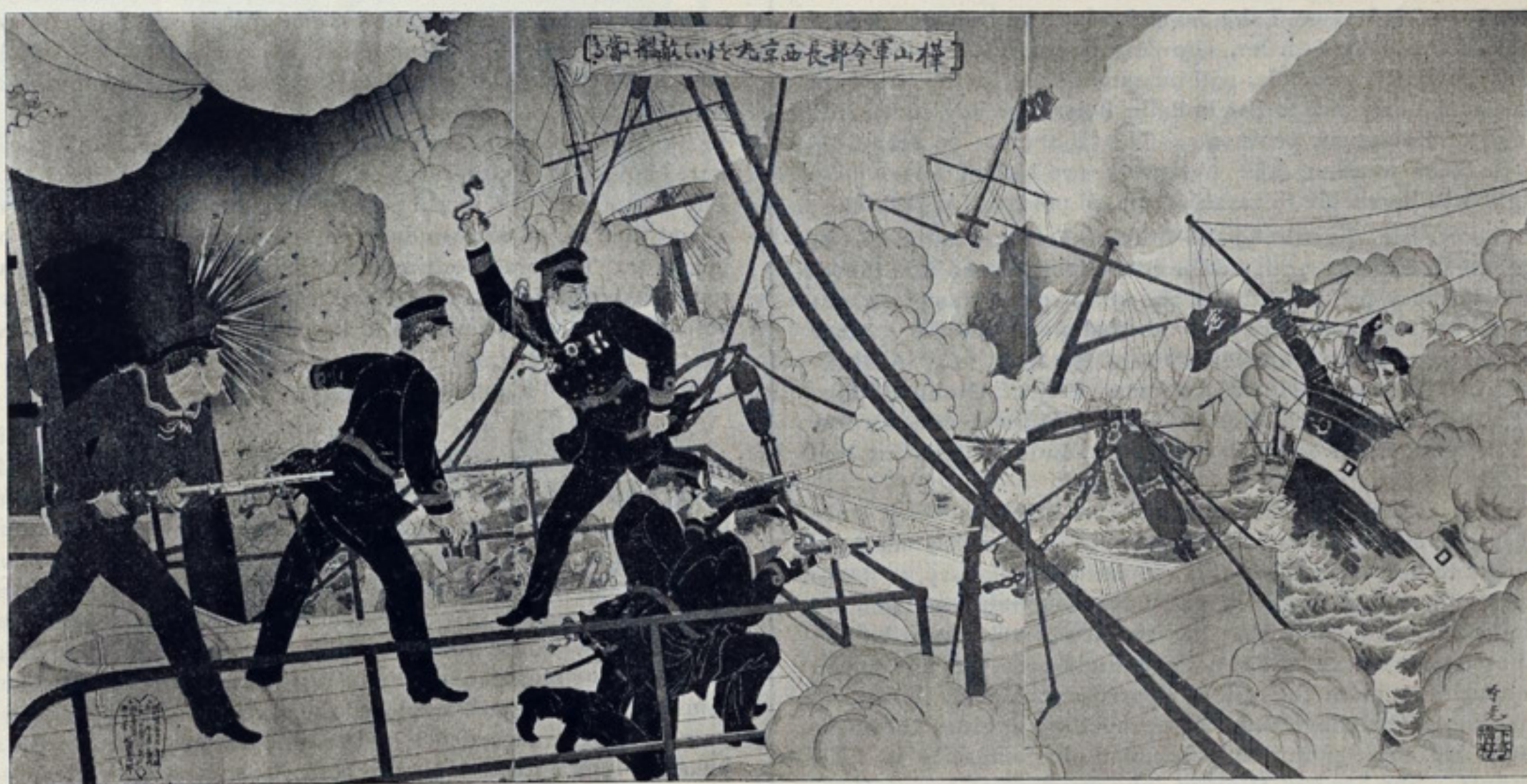
### Ship Yard Matters.

Although there is still considerable figuring going on for new steel vessels, additional contracts are slow in materializing, as the steel yards, excepting in two cases, are unable to insure delivery until July or August of next year. The contract for the big car ferry for the Flint & Pere Marquette Railway, which is quite certain to cost more than \$300,000, has not as yet been awarded, but a settlement of the matter is expected in a few days. The Chicago Ship Building Co. as well as F. W. Wheeler & Co., the Detroit Dry Dock Co., and the Globe Iron Works Co., is understood to be making a strong effort to secure the job. James McBrier of Erie and the Detroit owners of the steamer Bielman are still figuring with the different builders for steel tow barges, but as far as can be learned their negotiations are as far from a settlement now as they were several weeks ago.

Specifications for three steel propellers and ten tow barges of the kind that have for some time past been in service between Cleveland and New York via the Erie canal, have been prepared by the Cleveland Steel Canal Boat Co., and ship builders will be asked, this week, to bid on the vessels. The propellers will have considerable more power than the first steam vessel built for this service.

Engines for the steel package freight-steamer that is being built by the Union Dry Dock Co., Buffalo, on ship yard account, will be constructed by H. G. Trout and will have cylinders of 23, 38½ and 64 inches diameter by 42 inches stroke. The boilers, of which there will be four, will be 11½ inches diameter and 13 feet long, and will be built to withstand 175 pounds steam pressure.

O. W. Shipman, a Detroit coal dealer who conducts a very large business throughout Michigan and the northwest, has revived the scheme of operating car ferries between Cleveland and Port Stanley, Ont., to connect at the latter point with the London & Port Stanley Railway, which



JAPANESE PICTURE OF A NAVAL ENGAGEMENT DURING THE JAPANESE-CHINESE WAR.

which it is hoped will result from the effects of this convention, is and will be to lower the levels of the lakes. It may be fairly assumed that the regulation and control of the levels will have great utility in preserving as well as in creating depths of water suited for navigation.

Consider how a depth of twenty-six feet in and through the lakes is to be secured. Unless there be control of the levels, such depth must be devised on the basis of lower levels than any which have hitherto existed. Unless there be control, the difficulty of creating sufficiently deep harbors will be more than is necessary. Such control will render the state of the lakes positive and beyond a doubt; whereas, without it, the conditions will be tentative and the result to follow from any system of works will be in a degree uncertain. If the cost of such control does not exceed \$5,000,000, the expense may be rated to be small compared with the benefits to follow.

In conclusion, and by way of summary, it may be said that control is practicable from all points of view, the greatest difficulty being found in the international, and the least difficulty in the engineering questions involved. It is useful, not only from considerations of finance and convenience, but also because it will preserve existing conditions in spite of the many causes that do and will tend to destroy them.

would furnish important connections and open up quite a large territory for Ohio and Pennsylvania coal that is now burthened with heavy rail freights, on account of the long haul around Lake Erie. Mr. Shipman's plan is to interest English capital in the scheme. He talks of securing for the service car ferries that would cost \$300,000 or more each. His knowledge of the business and his ability to command capital for any practical enterprise attaches importance to the project.

The wooden steamer to be built by the Jenks Ship Building Co. of Port Huron will be 254 feet over all, 42 feet beam and 14 feet depth of hold. Engines will be of the compound type with cylinders of 25 and 50 inches diameter and a stroke of 40 inches, and the boiler will be 13 by 12 feet, allowed 125 pounds steam pressure. The vessel will carry about 2,000 tons from Lake Superior and will be worth about \$80,000.

About Nov. 30 a 10-inch steam fog whistle, sounding two blasts of three seconds and one of six seconds separated by two silent intervals of twelve seconds and one of twenty-four seconds duration, will be established at Manitowoc pierhead light station, Lake Michigan.

MASTERS OF LAKE VESSELS CAN NOT WELL AFFORD TO BE WITHOUT THE NEW CHARTS. EXAMINE THEM AT THE OFFICE OF THE REVIEW.



### Around the Lakes.

Mr. Crockett McElroy's steamer Unique, with Roberts water tube boilers, is again in operation between Detroit and Port Huron.

Receipts of ore at South Chicago this season will exceed by full 500,000 tons the highest record of previous years. On Nov. 1 the receipts aggregated 1,635,088 gross tons.

A fog signal sounding two blasts every forty-five seconds—one of three and the other of six seconds duration—will be established at Eagle Harbor, Lake Superior within a few days.

A quiet ceremony accompanied the burial of the remains of the late Commander Oscar F. Heyerman, U. S. N., in Detroit, Sunday. The funeral was conducted by Col. J. T. Sterling and companions of the Loyal Legion.

Letters bearing the following names await owners at the marine post-office, Detroit: Alex. C. Callan, Charles Cretoan, Thos. Finigan, M. I. Hayes, E. E. Humphrey, John F. Jefferson, John Mockles, Geo. McCarthy, Frank Place, Wm. Plumer, Fred J. Radloff, George Raymond, Mrs. Clemens Senger, M. Strant, John Stevens.

B. B. Inman of Duluth will make another effort to release the schooners Moonlight and Kent, ashore at Chocoday beach, Lake Superior. He agrees with the underwriters to deliver the boats at Duluth for \$9,500 before Feb. 1 next. In case he releases the Moonlight alone he is to receive \$5,000. If the underwriters so elect, they are to turn the boats over to him as full payment for his claim.

Osborn & Co. have closed a contract with the National Iron Works of Duluth for new boring dredge machinery invented by Capt. Wm. Osborn. The hull of the dredge will be built by N. Grignon of Duluth. It will be 75 feet long, 24 feet beam and 7 feet depth. The dredge will be of the hydraulic type and will have a capacity of about 3,000 yards daily, on fuel consumption of about a ton per thousand yards of material handled. The dredge will be completed about May 1, 1896.

Another harbor of refuge on Lake Superior is to be lighted. About Nov. 30, a light of the fourth order, showing fixed white varied by a white flash every forty-five seconds, will be established in the structure recently erected at the entrance to Lac la Belle, Bete Grise bay, south side of the outer end of Keweenaw peninsula. The light may be seen 13¼ statute miles in clear weather, the observer's eye 15 feet above lake level. The light will be visible to vessels from all points of approach.

The price reported in the sale, to the Mutual Transportation Co., of the big 415-foot steamer being built by the Globe Iron Works Co., Cleveland, is \$275,000 but it is probable that if the actual price was given out this figure would be found to have been shaded about \$10,000. Other transfers are: Steamer Iosco, Penoyer Bros. of Bay City, to W. A. Hawgood and others of Cleveland, \$110,000; steamer City of Grand Rapids, Capt. C. E. Wilbur of Charlevoix, Mich., to Capt. J. Hursley of Sault Ste. Marie; tug W. H. Wolf, estate of Jacob Johnson to Independent tug line of Buffalo, \$3,000.

W. F. Dempsey, engineer of the fireboat Cleveland, says that since the boat went into commission in June, 1894, only 75 cents has been expended for repairs to her boilers, and this was hardly necessary, as it was for a small piece of pipe that might as well have been replaced from old material around the vessel. The boat has two Almy water tube boilers of about 500 horse power each, allowed 150 pounds pressure, and steam sufficient in quantity to place the boat in operation instantly is kept up in them all the time. The Cleveland has propelling engines that have developed about 500 horse power and her pumping capacity is 7,000 gallons per minute. She has had trials of long duration at two or three big fires in the lumber district, and at no time since she was built has the department found her lacking in steam. Neither has it been necessary at any time to call for more water than she was capable of supplying at a fire. The pumps were built by Thomas Manning, Jr., & Co. of Cleveland.

### Trials of Belleville Boilers.

An interesting report of a test of Belleville water tube boilers is found in Engineering of London, issue of the 8th inst.. The boilers were constructed by Messrs. Maudslay, Sons & Field, British manufacturers for the Belleville company. They are to be installed in a twin-screw steamer that is being built in England for the Russian volunteer fleet. The boilers were arranged in series, exactly as they will be on ship board. The contract required that the evaporation on a trial of 12 hours' duration should be 8 pounds of water per pound of coal consumed. There were twenty-four boilers in all to supply twin-screw engines developing 12,500 horse power, and these are placed in the ship in three separate water-tight compartments. Each boiler consists of eight elements, each containing twenty wrought iron tubes, 4½ inches in outside diameter. But it was decided that it would be sufficient to test two of the boilers, the grate area of the two being 93 square feet, and the heating surface 2,946 square feet. The test, of course, was under natural draught conditions, and as it would have been expensive to erect

a chimney as high as that for the steamer, about 100 feet from the grate, it was decided to assist draft by a steam blast, and gauges were fitted to ascertain the pressure. Welsh steam coal of average quality was used. The trial commenced at 5:45 a. m., when the fires were lighted, the temperature of the atmosphere being 50 degrees Fahr. By 6:20 a. m. the boiler pressure was 200 pounds, according to steam gauge, and ten minutes later a preliminary hour's trial was commenced, to allow the amount of coal and water used to be adjusted. From 7 to 8 o'clock, 18 cwt. of coal was burned, the evaporation being 8.8 pounds of water per pound of coal. The official trial commenced at 8 a. m., and continued for 12 hours. The results are appended:

STEAM EVAPORATIVE TRIAL OF BELLEVILLE BOILERS.

Coal burnt.	Coal burnt per square foot of grate.	Water evaporated total.	Water evaporated per pound of coal.	Boiler pressure.	End of	
lb.	lb.	lb.	lb.	lb.		
2,016	21.36	17,700	8.78		1st hr.	
4,032	21.36	36,000	8.93		2nd hr.	
6,048	21.36	55,700	9.20		3rd hr.	
8,064	21.36	73,500	9.10		4th hr.	
10,080	21.36	90,000	8.92		5th hr.	
12,096	21.36	108,000	8.92		6th hr.	
14,112	21.36	126,000	8.92		7th hr.	
16,352	21.66	142,800	8.73	200	8th hr.	
18,368	21.62	160,500	8.73		9th hr.	
20,272	21.48	178,700	8.86		10th hr.	
22,400	21.58	196,700	8.73		11th hr.	
24,104	21.39	212,300	8.80		12th hr.	
	21.43 mean		8.88 mean			Temperature of feed 54 deg. constant throughout trial

During the first three hours the evaporation was equal to 9.2 pounds of water per pound of coal burned, and for the first six hours 9 pounds of water. At the end of the sixth hour the fires were cleaned out, and again at the end of the tenth hour, and no allowance was made in the weight of coals. The mean results, it will be seen, are 8.88 pounds of water evaporated per pound of coal, and 21.43 pounds of coal burned per square foot of grate area. The feed pump, it may be added, was of the Belleville type, and it worked satisfactorily throughout, averaging about eleven double strokes per minute.

An accumulation test was next made to ascertain if the safety valves were capable of dealing with any quantity of steam likely to be produced. The valves were set at 245 pounds pressure, and the coal consumption was at the rate of 35 pounds to 40 pounds per square foot of grate area per hour. This was continued for an hour, and the maximum pressure recorded was 247 pounds. This trial was entered upon in view of some objections raised recently as to the size of the orifice of the valve.

### The Phonograph as an Engineer.

It appears that the Knowles Pump Works, New York, put up a large pump for the Ricks Water Co's. Elk river pumping station, California. The pump was in constant use for some years and the makers heard no complaint until a few weeks ago, when they received a communication from the manager of the pumping station. Something was wrong with the pump, but they were unable to fix the defect, and as the dismemberment of the pump would involve much loss of time, and a visit by an expert from the east would mean considerable expense, the phonograph was resorted to. The manager spoke into the receiver, describing the symptoms of the pump, and he placed the receiver so that the pulsations of the pump would be recorded. Just as a physician listens to the action of the heart or lungs in the human body by means of a stethoscope, so the pump doctor listened by means of a phonograph to the throbs and pulsations of the pump thousands of miles away, and was enabled by that means to diagnose the disease. A reporter listened to the strange communication at the New York office of the Knowles company. The voice of the Californian was heard giving in a precise way the symptoms of the pump; then he asked the listener to pay attention to the pump's action—b-r-r-r-bang! b-r-r-r-bang! and an occasional wheezing which might be made by escaping steam. The engineer to whom the phonograph was submitted said that the record was perfect and the experiment proved absolutely successful. The proper remedy was suggested, and the pump is running once more "good as new."—The Engineer, New York.

An international naval exhibition is to be held at Kiel from May 25 to Sept. 30, 1896. The exhibition is to comprise all products in any way connected with the navy or shipping in general, as well on the sea as on rivers or canals. It is also to give a complete historical review of the development and progress made in ship building and all its kindred industries. The waters of the harbor of Kiel offer excellent opportunity for showing steam or electric launches, sailing yachts, row boat, etc. All inquiries for information should be addressed to "The Committee of the Exhibition, 1896, at Kiel."

ALL NEW HYDROGRAPHIC CHARTS ARE KEPT IN STOCK BY THE MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND.



**Capt. Wesley C. Brown.**

A very good likeness of Capt. Wesley C. Brown, who was recently appointed superintendent of transportation for the Northern Steamship Co., with headquarters at Buffalo, to succeed Capt. Killaran, is presented herewith. Illness has delayed Capt. Brown in taking up his new duties,



CAPT. WESLEY C. BROWN.

but it is expected he will be in full charge of the vessels of the Northern line next season. Capt. Brown was born in St. Clair, Mich., and his home is still at that place. He has followed the lakes from boyhood and has been in charge of vessels for a great number of years past. His last command was the steamer Centurion, one of the best steel vessels on the lakes. He was in the steamer Mark Hopkins previous to the Centurion, and in earlier years commanded the John F. Eddy, Siberia, Oswegatchie and other vessels.

**Dreary North Shore of Lake Superior.**

The recent accident to the steamer Missoula tends to show more clearly than anything that has occurred of late the vast area of Lake Superior and the possibility of a vessel's crew reaching land after shipwreck and yet being unheard of for a couple of weeks after starting on a voyage. The shores of Michigan, Wisconsin and Minnesota on the big lake are traversed by railways and telegraph lines, and the towns and small settlements on the American side of the lake, even to the islands, furnish ready means of communication with the larger lake cities, but not so on that part of the Canadian shore north of the lakes, where a wilderness inhabited by a few fisherman and Indians exist. This is especially true of the Canadian shore just above Sault Ste. Marie and for a long stretch of country to the south and east of the point where the Canadian Pacific Railway turns into the shore of the lake and traverses it on towards Port Arthur and Fort William.

When the Missoula broke her shaft and was rendered helpless she was less than twenty-five miles from Caribou island on the course down towards Sault Ste. Marie. She was somewhat off the regular course of vessels bound down from the head of Lake Superior, but if she had been able to make any headway towards the Sault, or care for herself at all on the course she was following, she would have been picked up very soon after the accident by some passing vessel. But a southerly wind drifted her out of the course of even the few vessels trading to Canadian ports at the head of the lakes, and she was working over towards the wildest part of the Canadian north shore territory when her crew was compelled to abandon her.

A glance at the chart will show that Brule point, where the crew of the Missoula first made land, is scarcely more than seventy-five miles from Sault Ste. Marie, where 15,000,000 tons of freight passes through a canal in a single season, and yet the men in one of the Missoula's yawl

boats spent nearly two days working along the shore of the lake before they found any more sign of life than a deserted fisherman's shanty, in which they built a fire and dried their wet clothing. The fishing season had closed, but even fishermen are scarce in this territory during the most active periods. It is not strange, therefore, that the men from the Missoula were nearly a full week in finding means of communicating with the owners of the vessel after they had landed on the dreary north shore of Lake Superior.

**Plans for Rebuilding the Menominee.**

Details regarding plans for rebuilding the Goodrich line steamer Menominee at the Manitowoc dry dock during the winter would indicate that when the work is completed she will be practically a new vessel. Her stern will be cut off for about 50 feet and a new after body built with 15 feet added to the original length, making the vessel 201 feet keel, 215 feet over all, 30 feet beam and 35 feet in main deck inside of sponson wales. The depth of hold will be 11 feet 6 inches. She will be given a new main deck and a better sheer, increasing her depth at stern head 6 inches and at some places 18 inches. The guards and outside planking will be stripped off her cabin length to the under side of bilges and heavy steel diagonal straps laid on frames, spaced about 5½ feet in the square and connected at the top to a longitudinal chord of double channels of steel over an oak chord which will be strongly scarphed. The top chord will be supported by truss posts about 9 inches thick, spaced about 11 feet apart and extending well forward and aft. The foot of posts extend lower than beam knees, and will be notched onto the shelf and bolted through frame and ceiling. A heavy steel plate will be worked under beams and at frameheads a sheer strake. The whole structure makes a neat, strong truss and it is all out of the way, within the cabin deck, and much superior to the old style of wood arch now being abandoned. The vessel will be sheathed with iron for winter service on Lake Michigan and will be rigged with two pole spars of about 90 feet, on which will be light gaffs for sail when necessary.

Cabins will be thoroughly overhauled and renewed, and additional state rooms built on the hurricane deck, which will be reached through a spacious stairway from the main saloon. The vestibule at the top of the stairway is to be finished in hardwood and handsomely upholstered for the comfort of ladies. The after state rooms on this deck can be reached from a stairway at the after end of the saloon, and conveniently located to these rooms is a well-ventilated and commodious smoking room with all its accessory comforts. There will be no patent pull-out berths in the saloon, as it has been found that berths of this kind when in use limit the seating capacity of the saloon for passengers who may be traveling without state rooms. Accommodations include fifty-two state rooms for 108 passengers on the cabin deck and twenty-four state rooms for forty-eight passengers on the hurricane deck. The main saloon and other apartments throughout will be well supplied with electric light. The gally, pantry and culinary facilities generally will be enlarged. Painting and decorating will probably be done by Messrs. Crossman & Sturdy, artists and decorators of Chicago.

The engine will be of the compound type, of 900 indicated horse power, and will be built by Chas. F. Elmes of Chicago. Steam will be furnished by two new boilers of Scotch type, 10 feet in diameter by 10 feet 6 inches long. They will have 2¾-inch tubes and will be allowed 145 pounds steam pressure. Builders of the boiler are Messrs. John Mohr & Son, Illinois street, Chicago.

All the plans for the work have been gotten out by the Goodrich Trans. Co. at their office in Chicago. The contract for cabin work will be let next week. An effort will be made to have the steamer's name changed before going into commission next June, as she will be practically a new boat and as good as any in the line, except perhaps the steel steamer Virginia. W. J. Wood, naval architect of Cleveland, will probably spend the winter at Manitowoc seeing that this work is carried out in accordance with the plans and also looking after extensive alterations in the steamer Atlanta.

"Through battleships alone can an enemy be met and vanquished, even before he sights our coast," says Chief Naval Constructor Hichborn in a paper read recently before the Society of Naval Architects and Marine Engineers in New York city. "It is also true," he adds, "that through battleships alone can any successful demonstration be made against an enemy's seaports. In a word, battleships are the real bone and sinew of any naval force, and no maritime country can be great in offense or defense without fully accepting this almost axiomatic statement." Mr. Hichborn thinks we are fairly well supplied with cruisers and gunboats, but in torpedo boats we are sadly deficient, as it is upon this class, he says, in conjunction with our land batteries and low free-board iron-clads that we must mainly depend in defending our harbors from the attack of a powerful naval adversary and lack of foresight in providing adequately for this branch of our scheme of naval defense might be fraught with serious consequences in the advent of war."





DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

Published every Thursday at No. 516 Perry-Payne building, Cleveland, O

SUBSCRIPTION—\$2.00 per year in advance. Single copies 10 cents each. Convenient binders sent, post paid, 75 cents. Advertising rates on application.

The books of the United States treasury department on June 30, 1895, contained the names of 3,342 vessels, of 1,241,459.14 gross tons register in the lake trade. The number of steam vessels of 1,000 gross tons, and over that amount, on the lakes on June 30, 1894, was 359 and their aggregate gross tonnage 634,467.84; the number of vessels of this class owned in all other parts of the country on the same date was 316 and their tonnage 642,642.50, so that half of the best steamships in all the United States are owned on the lakes. The classification of the entire lake fleet on June 30, 1895, was as follows:

Class.	Number.	Gross Tonnage.
Steam vessels.....	1,755	857,735.00
Sailing vessels.....	1,100	300,642.00
Unrigged.....	487	83,082.00
Total.....	3,342	1,241,459.00

The gross registered tonnage of vessels built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

Year ending June 30,	Number.	Net Tonnage.
1891.....	204	111,856.45
1892.....	169	45,168.98
1893.....	175	99,271.24
1894.....	106	41,984.61
1895.....	93	36,353.00
Total.....	747	334,634.28

#### ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

(From Official Reports of Canal Officers.)

	St. Mary's Falls Canal.			Suez Canal.		
	1894.	1893.	1892.	1894.	1893.	1892.
No. vessel pass'ges	14,491	12,008	12,580	3,352	3,341	3,559
T'n'ge, net registd	13,110,366	9,849,754	10,647,203	8,039,106	7,659,068	7,712,028
Days of Navigat'n	234	219	223	365	365	365

Entered at Cleveland Post Office as Second-class Mail Matter.

AGAIN THE United States inspectors of steam vessels make a report to the effect that dirty water from the Chicago river, used for making steam in the boilers of harbor tugs, is the cause of a fatal disaster. A year or more ago a report of this kind was made by the inspectors immediately following an accident on one of the tugs, and now the loss of life in the explosion on the tug Morford, which occurred a few weeks ago, is attributed to the same cause. Organic matter in the river water is said to cause foaming in the boilers, which makes it impossible to keep the water at proper height. Sudden stopping and starting of the engines, with the water low and the boiler foaming, is said by the inspectors to be the cause of these accidents. Owners of the tugs say that the boilers are cleaned as often as possible, and that the Morford's boiler was thoroughly cleansed only a day or two before the accident. If such is the case, some measure of law should be devised to act against the use of such water in the boilers of any steam vessel.

THE report of the sale of the Hamilton and Ludington mines to the Chapin Mining Co. is probably authentic; or it may be said more properly that these mines will again be opened up and managed next year in the office of M. A. Hanna & Co. There is no official announcement to that effect, but the relations which these mines bear to the Chapin company are well understood. They are very deep and in their present condition, filled with water, can best be pumped out and operated in connection with the Chapin.

ONE OF THE most encouraging signs of substantial prosperity in the iron industry is the scarcity of labor in iron mining districts of Michigan, Wisconsin and Minnesota. Skilled miners are particularly scarce, and command good wages. Never have there been so many men wanted on the Mesabi, and the Vermilion range has jobs for as many as at any time in its history. Wages have been advanced two or three times, and will probably soon be again increased.

VESSELS THAT will carry a million and a half gross tons of freight next season on 14 feet draft are now under contract in lake ship yards. Their aggregate value is nearly \$5,000,000. Labor is the biggest item of cost in their construction and they will give employment to a big army of skilled workmen. But best of all there is every assurance of employment for them for two or three years to come at profitable rates of freight.

#### Lake Freight Matters.

Interest in lake freight circles now centers in next season's business. Shipments of ore from Lake Superior, even in the vessels of the iron ore companies, are practically at an end, and with zero weather in the Lake Superior region the matter of loading the few vessels that are under engagement at Escanaba before the ore freezes in the pockets is of more importance than the question of freight rates. As shown by a summary of ship building operations, printed elsewhere in this issue, new freight vessels now under contract in lake ship yards are capable of moving practically 1,500,000 gross tons of ore from Lake Superior next season on the present draft of about 14 feet. This is a big item in the matter of freights, and shippers will undoubtedly hold it up as a bear argument in their dealings with vessel owners for next season, but it is quite certain that the increase in ore shipments alone for another year will be more than equal to the capacity of new tonnage. These returns as to new tonnage are certain to have an effect on the freight market, however, as it must be admitted that the capacity of vessels lost during the season is a small item when compared with the work which the ship builders now have on hand. It is more than probable that there will be nothing done in iron ore contracts until after Jan. 1, 1896, as the ore dealers, who are trying to come to an agreement regarding output and prices, have a much bigger problem on hand than they had a year ago and they are slow in reaching conclusions.

#### Canadian Deep Waterways Commissioners.

Information has just been received from Ottawa to the effect that the Canadian commission appointed to act with the United States deep waterways commissioners, named a few days ago by President Cleveland, will be made up of Oliver A. Howland, M. P. of Toronto, Thomas C. Keefer and Thomas Monro. Mr. Howland is president of the International Deep Waterways Association; Mr. Keefer is one of the most able and expert engineers in America, and Mr. Monro, president of the Canadian Society of Engineers, is in charge of the work of enlarging the St. Lawrence canals. It is expected that these gentlemen will meet within a couple of weeks, probably in Cleveland, with the United States commission, which is made up of James B. Angell of Ann Arbor, Mich., who has been president of the University of Michigan since 1871, except during 1880-1, when he was minister to China; Lyman E. Cooley, who spent a great number of years in the government and other service on the St. Lawrence, great lakes, Missouri and Mississippi rivers and the Chicago drainage canal; and John E. Russell of Massachusetts, who was a member of congress and who will represent seaboard interests on the commission.

Five thousand copies of the proceedings of the first annual meeting of the International Deep Waterways Association, held in Cleveland in September last, are now being sent out by Secretary Frank E. Flower, who has made his headquarters at the Hollenden, Cleveland, since adjournment of the Convention. If funds can be obtained, 10,000 more, and possibly 15,000 of these proceedings will be distributed throughout the United States and Canada. The book contains 465 pages, making up the most elaborate collection of reading matter on the subject of a deep-water outlet from the lakes to the Atlantic that has ever been published.

#### Estimates on River and Harbor Work.

During the year ending June 30, 1895, there was expended on river and harbor improvements in this country, exclusive of the amounts expended by the Mississippi and Missouri river commissions, the sum of \$15,440,994, making the total for the past two years \$30,904,044. Recommendations just submitted by the chief of army engineers to congress make the following estimates for continuing work on the lakes: Ship channel between Chicago, Duluth and Buffalo, \$500,000; Detroit river, \$30,000; Agate Bay harbor, Minnesota, \$30,000; Duluth harbor, \$75,000; Superior bay and St. Louis bay, \$50,000; Ashland, Wis., \$25,000; Portage lake and Superior canal, \$75,000; Grand Maria, \$30,000; Pensaukee harbor, Wisconsin, \$35,000; Green Bay, \$25,000; Sheboygan harbor, \$25,000; Milwaukee bay, \$25,000; Racine harbor, \$20,000; Waukegan harbor, \$20,000; Calumet harbor, \$20,000; Calumet river, \$50,000; Illinois river, \$50,000; Illinois and Mississippi canal, \$150,000; Michigan City harbor, \$95,000; St. Joseph harbor, \$30,000; Grand Haven, \$25,000; Muskegon harbor, \$30,000; Charlevoix harbor, \$25,000; Saginaw river, \$40,000; Sand Beach, Mich., \$20,000; Toledo harbor, \$150,000; Sandusky, \$40,000; Cleveland harbor, \$100,000; Fairport harbor, \$20,000; Ashtabula harbor, \$50,000; Conneaut harbor, \$40,000; Dunkirk harbor, \$20,000; Buffalo, \$100,000; Tonawanda and Niagara river, \$50,000; Oswego harbor, \$35,000; Ogdensburg harbor, \$20,000.

According to the latest report of Supt. Kimball of the life saving service, the establishment embraced on June 30, 1895, 251 stations—184 being on the Atlantic, fifty-three on the lakes, thirteen on the Pacific and one at the falls of the Ohio at Louisville, Ky.



## Actual Cost of War Ships.

In view of the fact that lake ship builders may at some time in the future be enabled, through the abrogation of existing treaty relations with Great Britain, to secure a part of the work of building naval vessels, it may be interesting to note the cost of a big war ship. Figures given in reports of contracts with the ship builders are far short of the actual cost of these vessels big and small. It is probably not generally known that contracts with ship builders do not include armor and that there are other items which make up a total cost that is almost double the figures usually announced when a contract is let to the ship builder. The following table will show, for instance, the relative cost of construction, armament, etc., of the battleship Indiana:

Accepted bid for hull and engines.....	\$8,060,000
Mounting of guns and extras.....	180,000
Bonus to builders for extra half knot.....	50,000
Armor, 3,000 tons.....	1,800,000
Armament.....	1,508,000
Trial trip.....	30,000
<b>Total.....</b>	<b>\$6,628,000</b>

There are incidental expenses which will bring the cost up to nearly \$7,000,000, and thus the Indiana with two sister ships make up in cost the neat sum of \$21,000,000. In view of present strained relations between the nations, there is no telling, however, when these vessels may be of great service to the United States.

Further complications may add to the possibility of a naval war and may result this winter in the largest programme for new war ships that has ever been brought before congress; and if conditions warrant the construction of vessels on a big scale it is not probable that the objections of congressmen from interior states will weigh against public sentiment in the matter of naval defense.

## Stocks of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store at the principal points of accumulation on the lakes on Nov. 16, 1895:

	Wheat, bushels.	Corn, bushels.
Chicago.....	20,905,000	1,037,000
Duluth.....	5,980,000	.....
Milwaukee.....	632,000	.....
Detroit.....	447,000	7,000
Toledo.....	1,049,000	66,000
Buffalo.....	2,477,000	237,000
<b>Total.....</b>	<b>31,490,000</b>	<b>1,347,000</b>

As compared with a week ago, the above figures show at the several points named an increase of 1,788,000 bushels of wheat and a decrease of 421,000 bushels of corn.

The Western Electric Co. of Chicago, which manufactures Lieut. Fisk's range finder and other marine specialties, is developing into an immense concern. An eight-story building now in course of construction for this company at West Congress and Jefferson streets, in the rear of the present factory, will, when completed, make their works then cover 104,000 square feet of space, and this with their branch factories in New York, Antwerp, Berlin and Paris will make a total of sixteen acres occupied by them. One of the most interesting features of the building is that it is constructed to accommodate a traveling crane, with a span of 25 feet, a space reaching the entire length of the building and taking up the basement and first story being set aside for this purpose. The crane will be used in handling heavy castings, like those which enter into the construction of the new types of dynamos and motors. Electric transmission will be substituted almost entirely for other methods when the new arrangements are completed. Among the leading products of the works are telephones and telephone appliances, underground electric cables, insulated wires, arc light machines, motors, police and fire alarm boxes and telegraph instruments. In manufacturing cables this company keeps five presses going and consumes 300 tons of pig lead per month. At Chicago employment is given to 1,500 men, making a total, including those at the branches named, of 3,000 employees.

Lieut. Col. Wm. Ludlow, corps of engineers, U. S. A., who was a member of the Nicaragua canal commission, has left for England to resume his duties as military attache of the United States embassy at London.

Smith Transit Co. is the name of the corporation that will own the steamer Iosco, recently purchased by W. A. Hawgood and others of Cleveland.

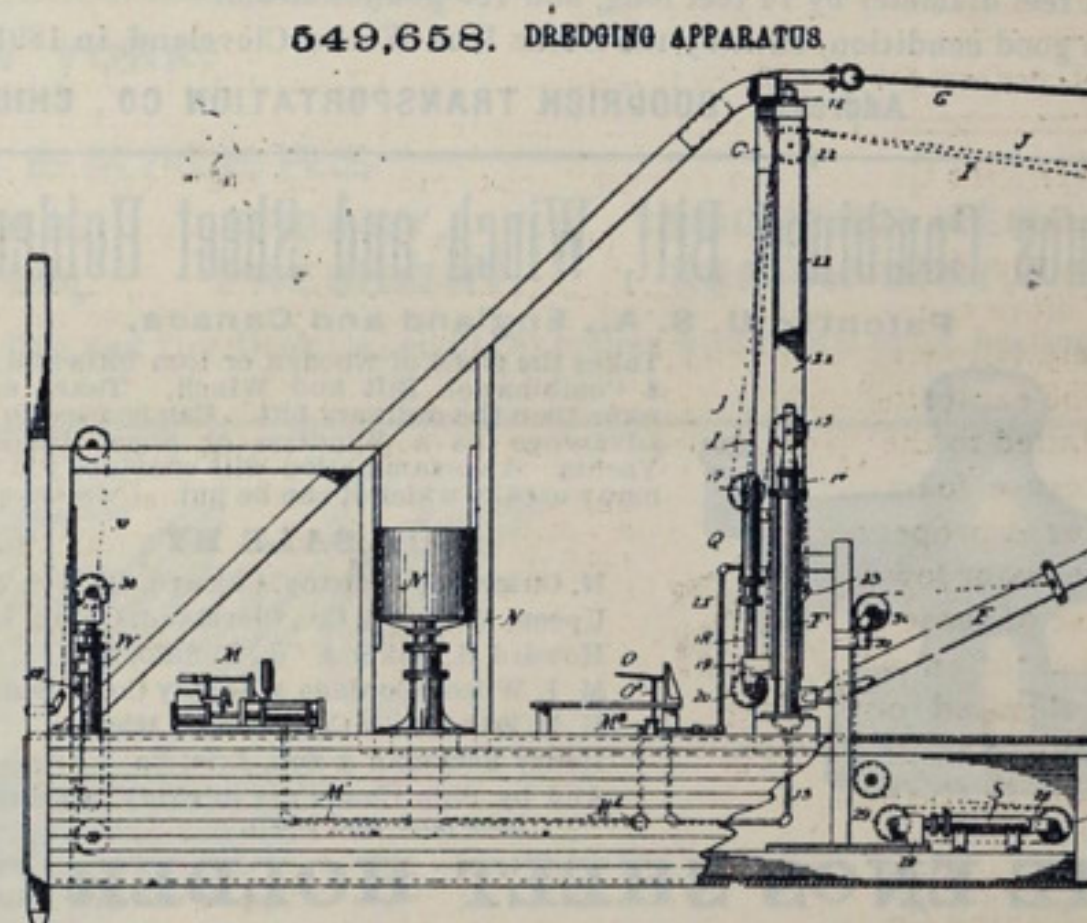
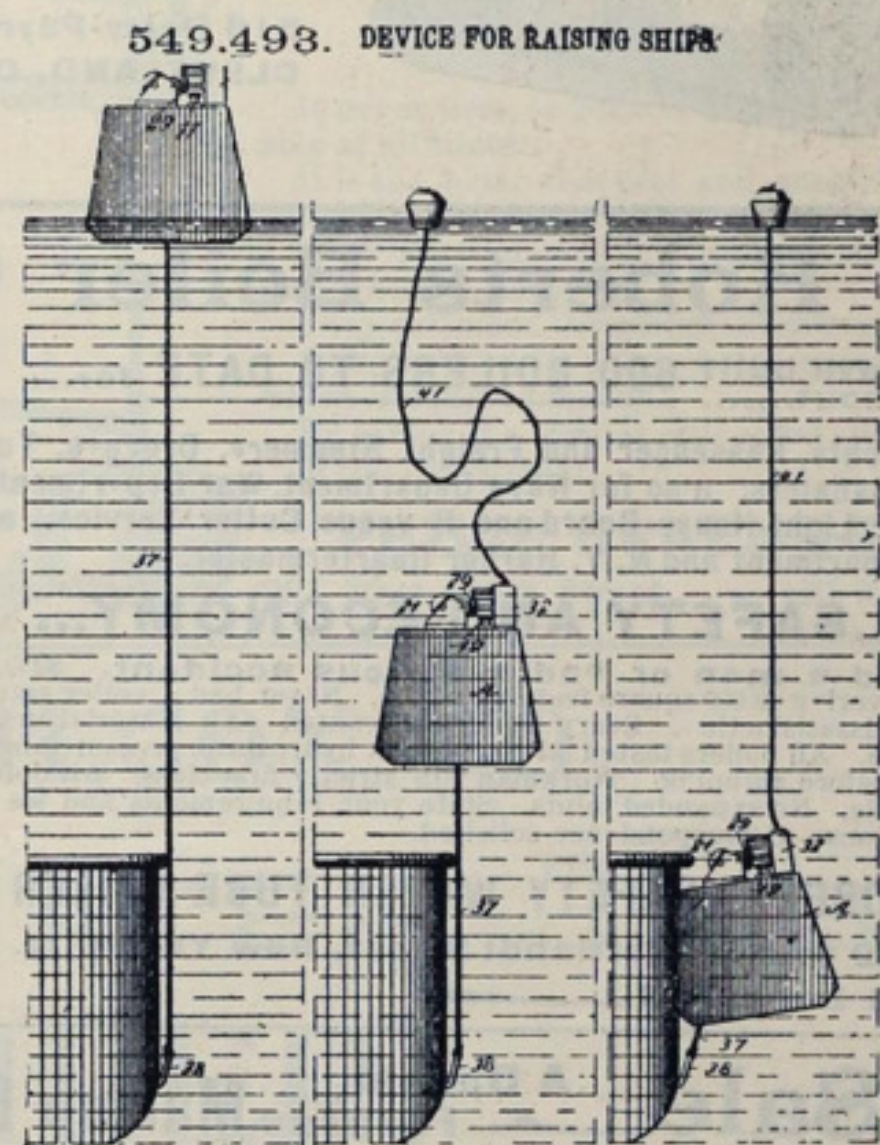
A biographical sketch of Irving M. Scott and an article on the "Development of the Ship Windlass" are features of Cassier's Magazine for December.

## Illustrated Patent Record.

SELECTED ABSTRACTS OF SPECIFICATIONS OF A MARINE NATURE—FROM LATEST PATENT OFFICE REPORTS.

549,493. Device for Raising Ships. John D. Cooper, Cheboygan, Mich. Filed Dec. 12, 1894. Serial No. 531,542.

Claim—In a device for raising sunken vessels and objects, the combination, with a pontoon provided with an interior chamber and walled channels extending through the same from top to bottom, ports leading from the walled channels into the said chamber, gates normally closing the said ports and electrically operated, and a pump located within the pontoon chamber, adapted to force water therefrom, the said pump being provided with a drive shaft extending through the upper portion of the



pontoon, of a windlass provided with a detent mechanism, located over each channel in the pontoon, a cable attached to each windlass and extending downward through the channels, being adapted for engagement with the vessel to be raised, an electric motor, a line shaft in communication with the windlasses, an electrically operated shifting gear adapted for driving connection either with the line shaft or the pump shaft, the wires from the mechanism controlling the shifting gear, the motor and the mechanism controlling the gates being connected with an object adapted to float on the surface of the water.

549,658. Dredging Apparatus. William B. Pless, Stockton, Cal., assignor to the Pless Dredging and Reclamation Company. Filed Jan. 2, 1894. Serial No. 495,338.

Claim—In combination, the mast and swinging boom, the bucket, the hoisting and dumping chains passing over guide pulleys to a fixed support, the main vertical hydraulic plunger secured to said mast and carrying two pulleys bearing against the intermediate portions of said chains for simultaneously straining and slackening them, and the second hydraulic plunger carried by the cylinder of the main plunger and operating in a reverse direction to independently strain and slacken the hoisting chain.





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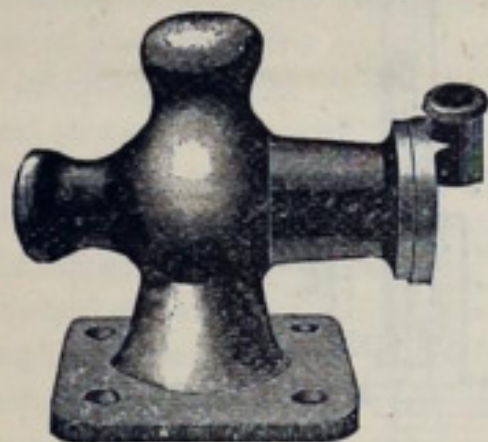
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Length, 400 feet,

Width:

On top, 95 feet,

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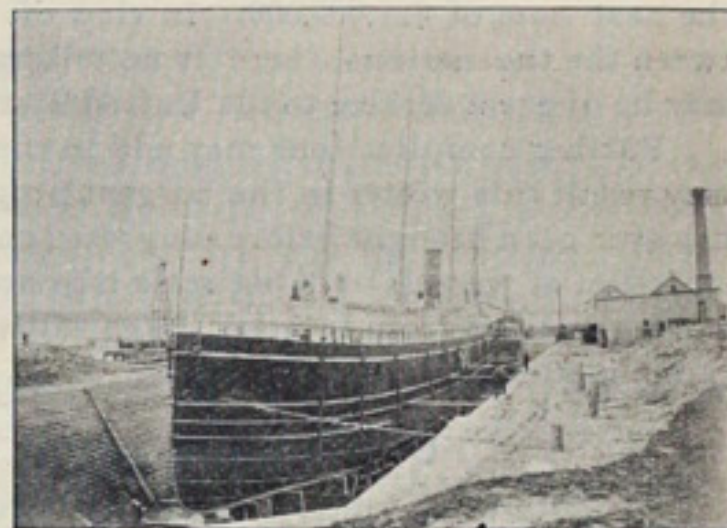
Gate, 82 "

Depth:

To Floor, 20 ft.

To Sill, 18 ft.

On Blocks, 16 ft.



Dry Dock large enough to dock the largest steamers on the lakes. Docking, Repairing and Spar Making. Dock has pit to ship rudders.

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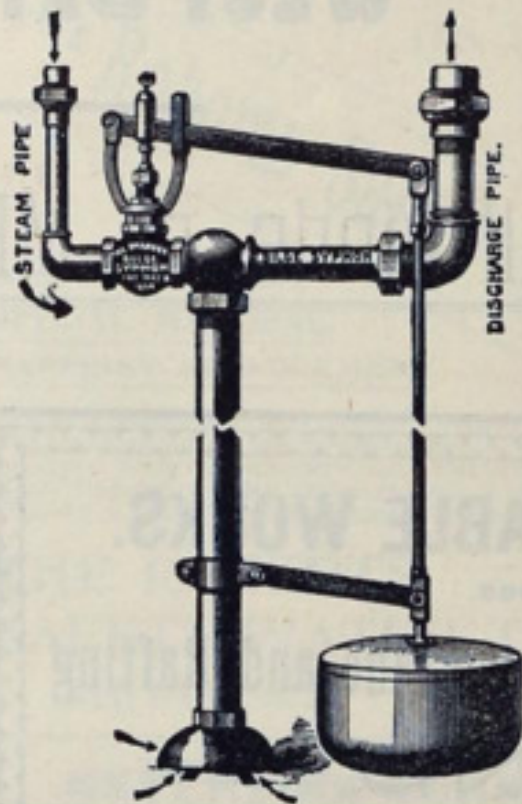
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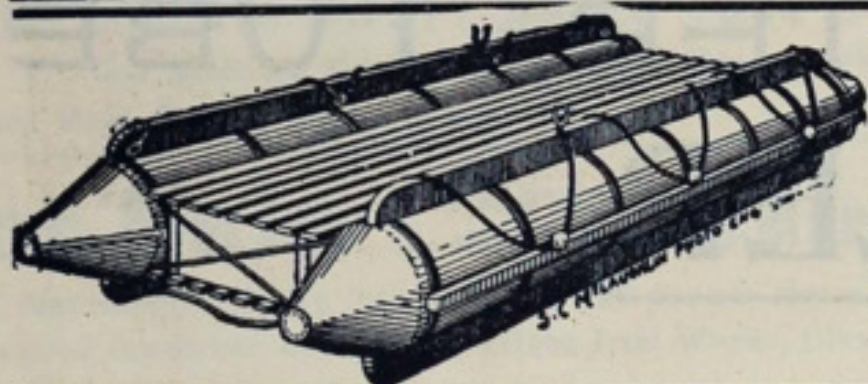
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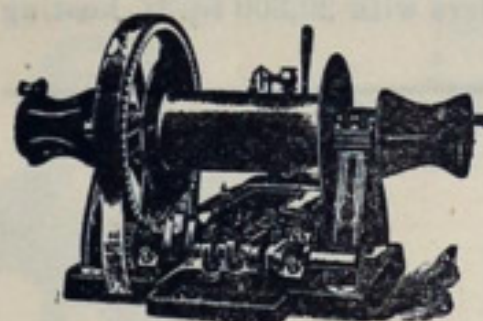
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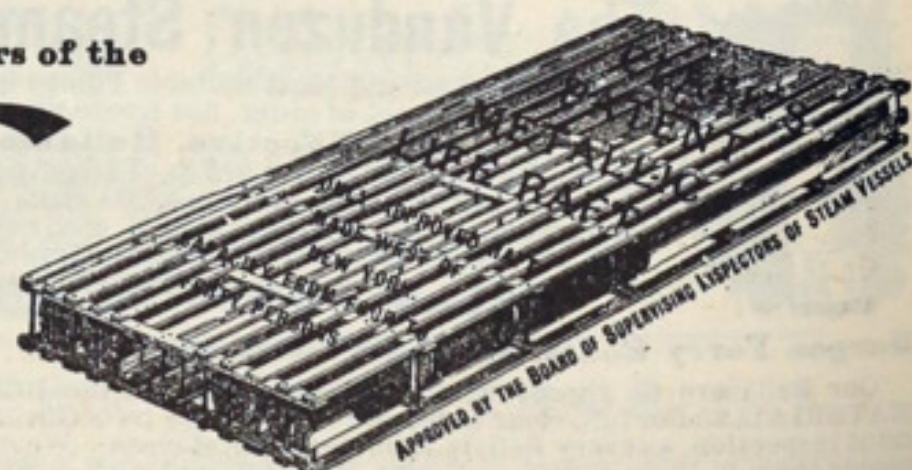
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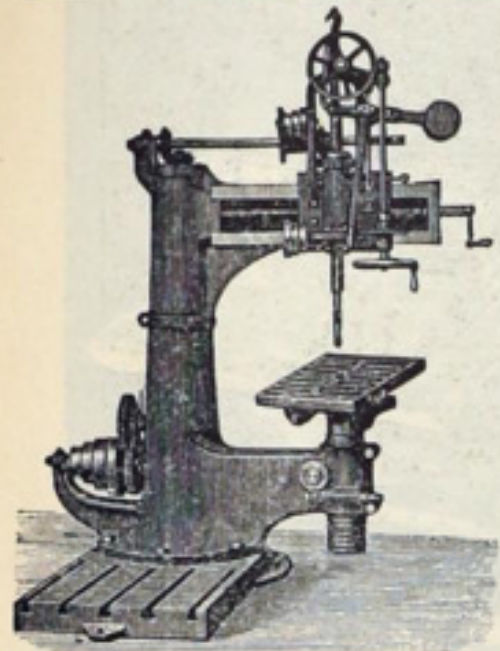
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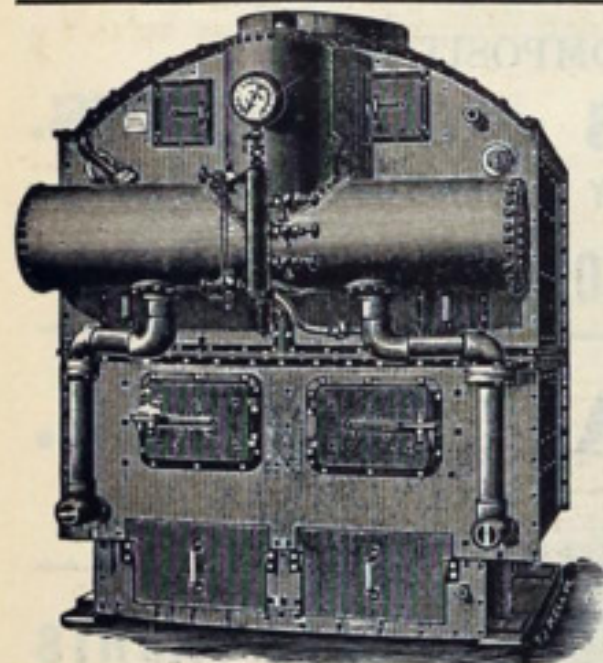
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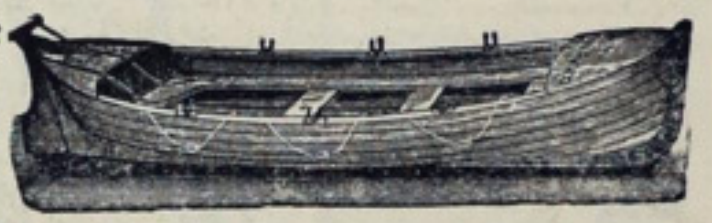


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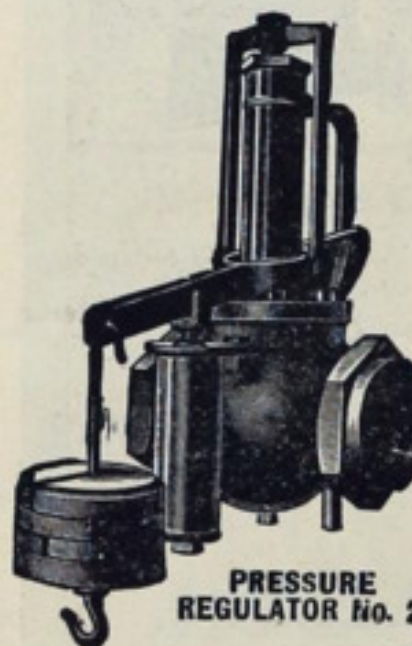
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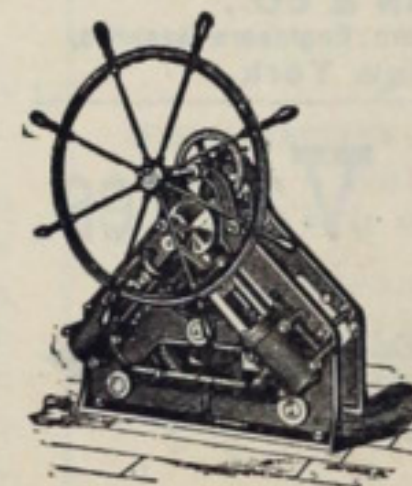
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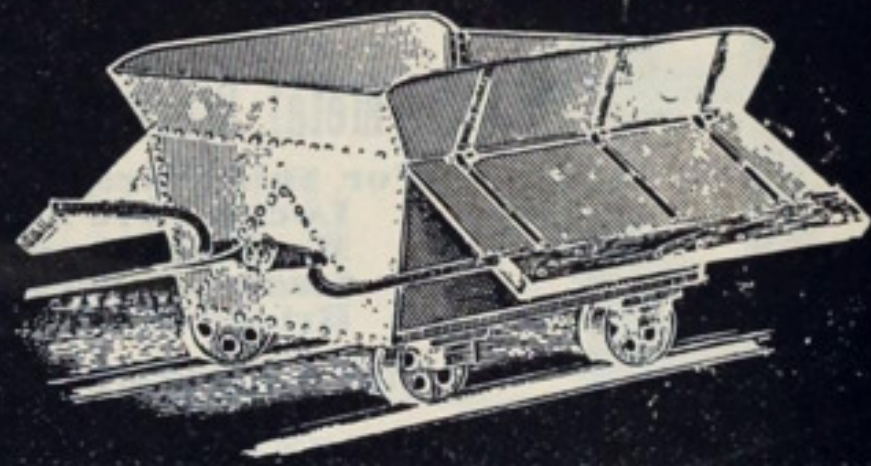
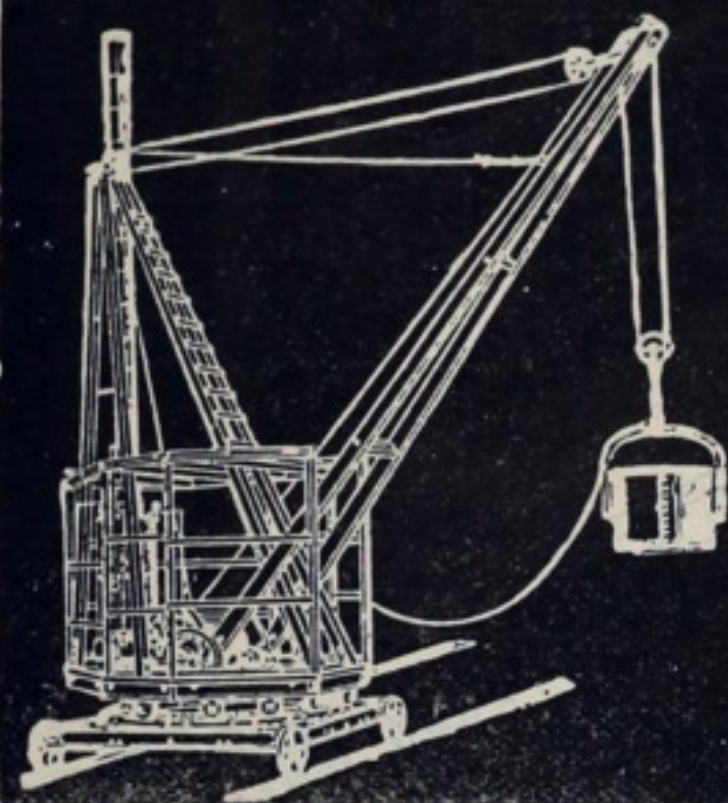
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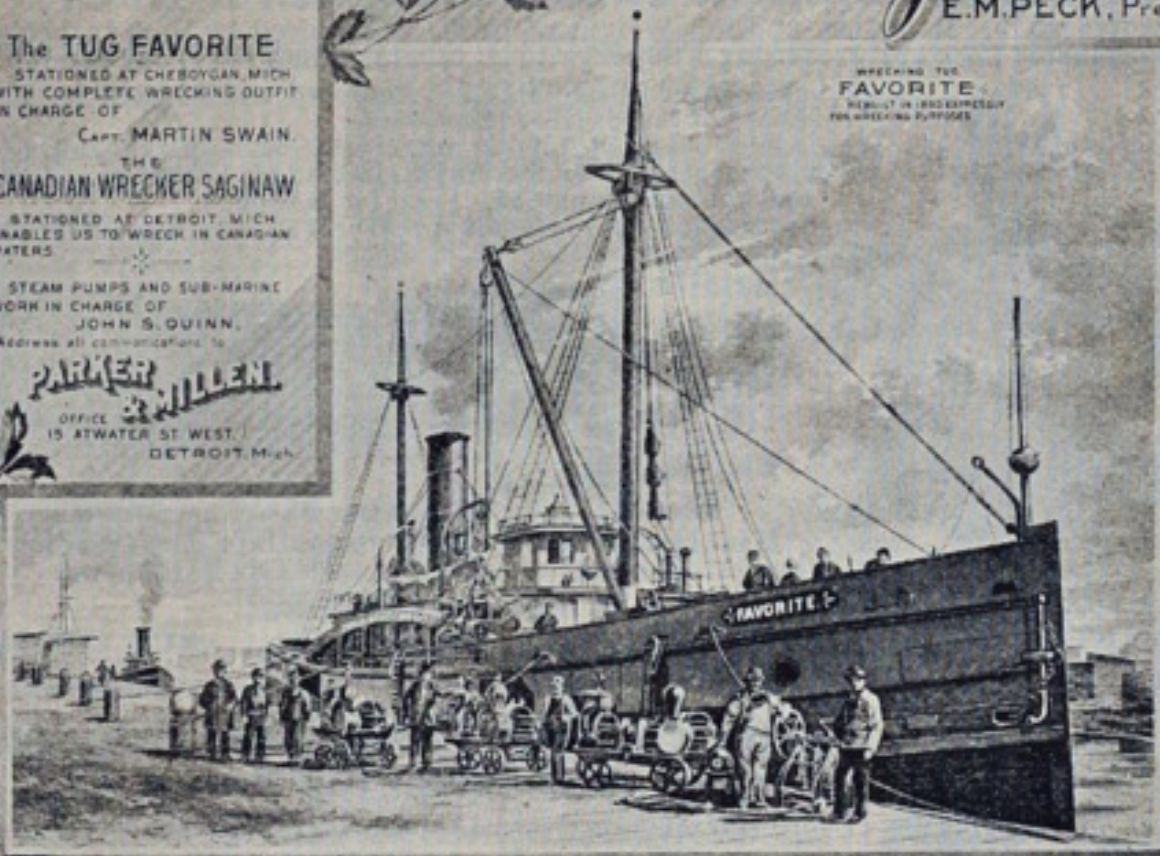
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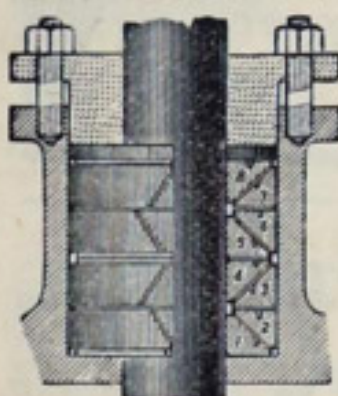
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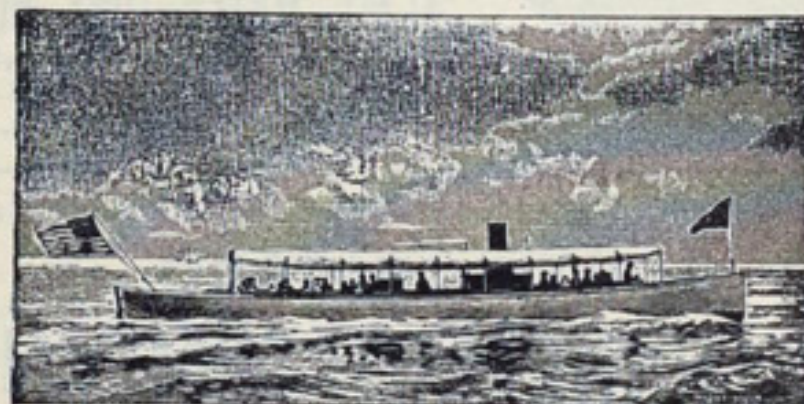
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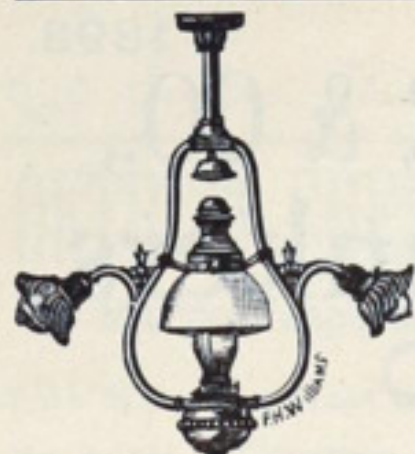
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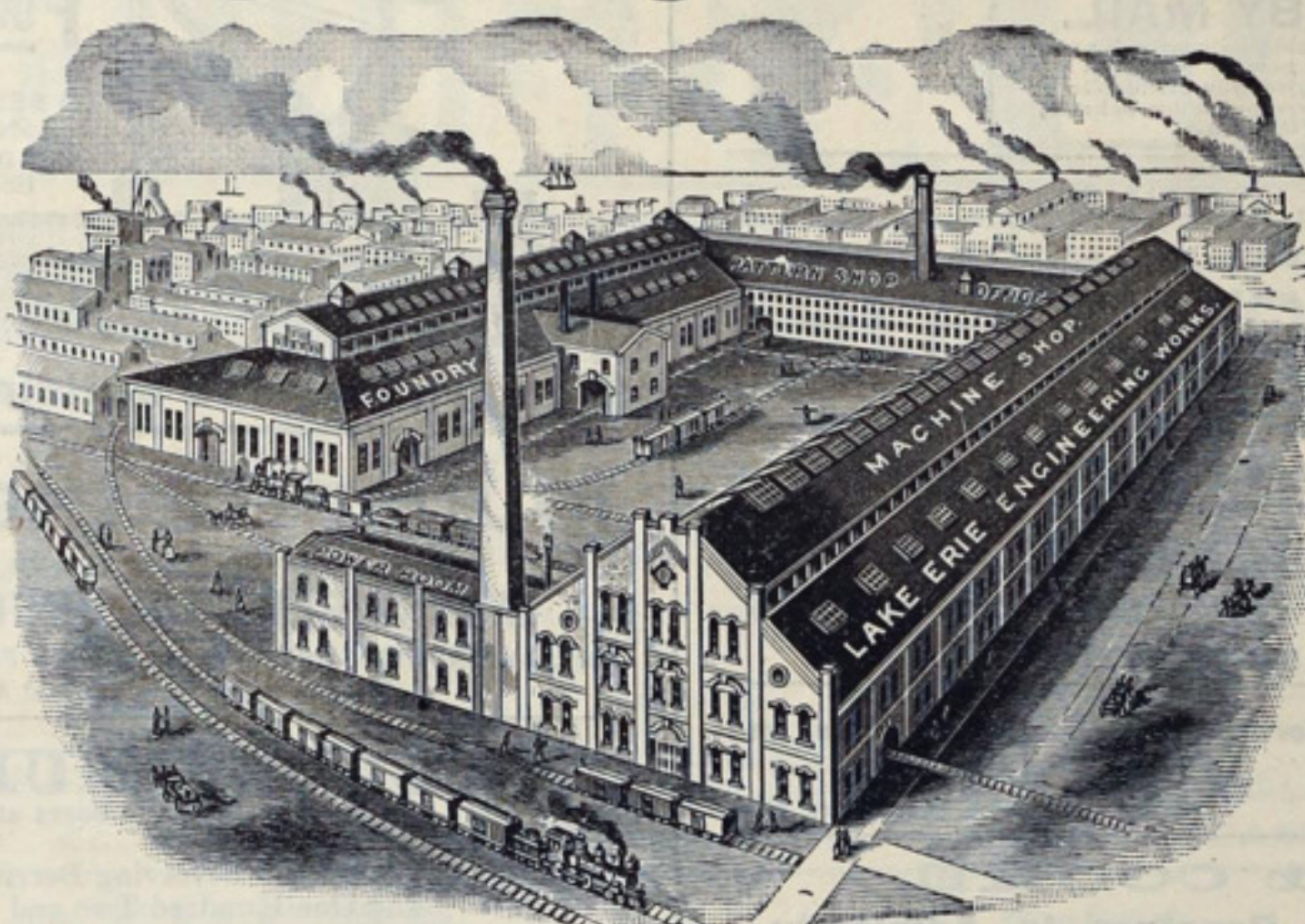


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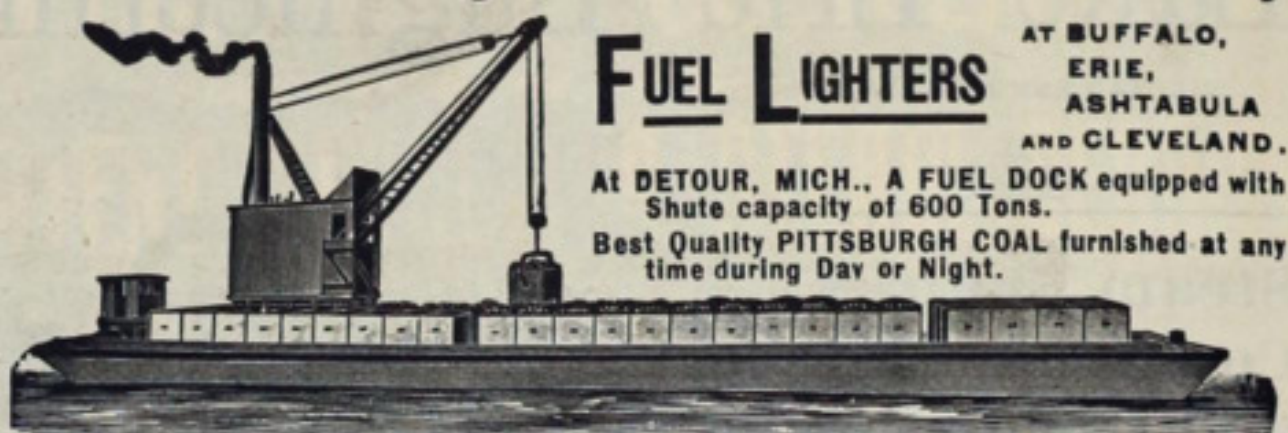
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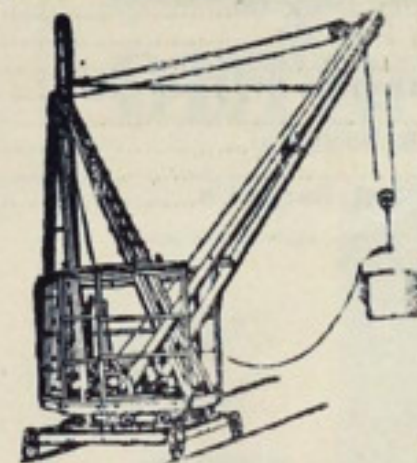
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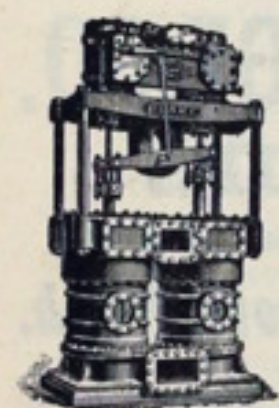
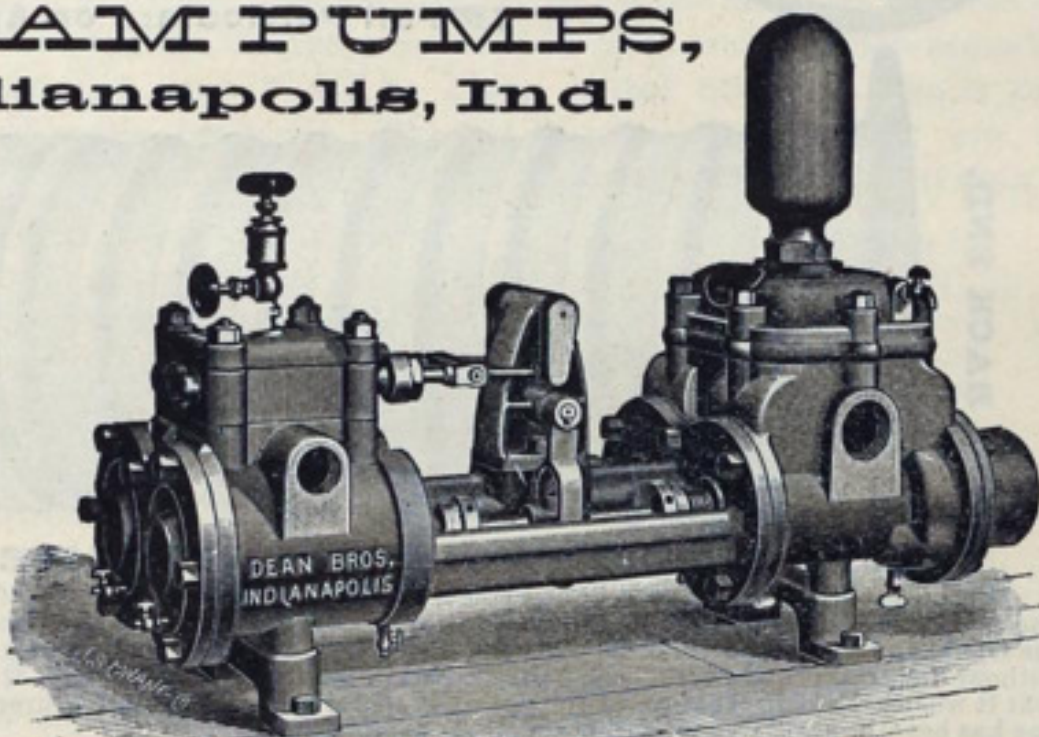
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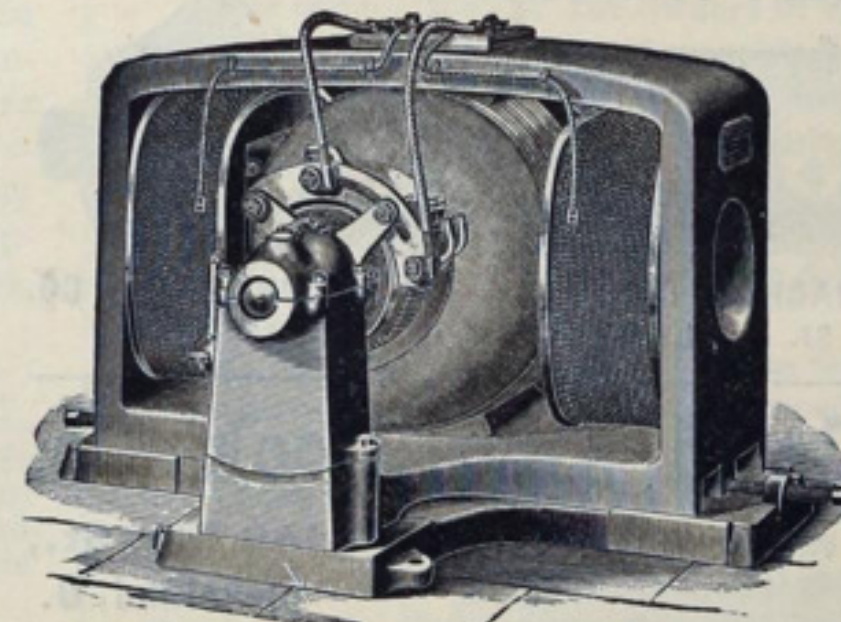
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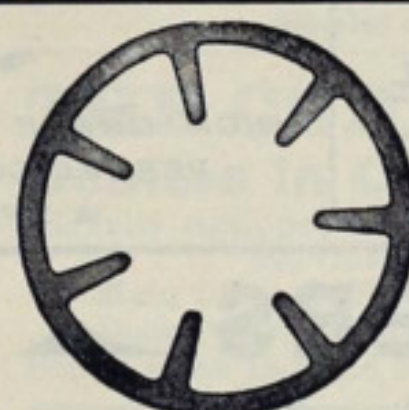
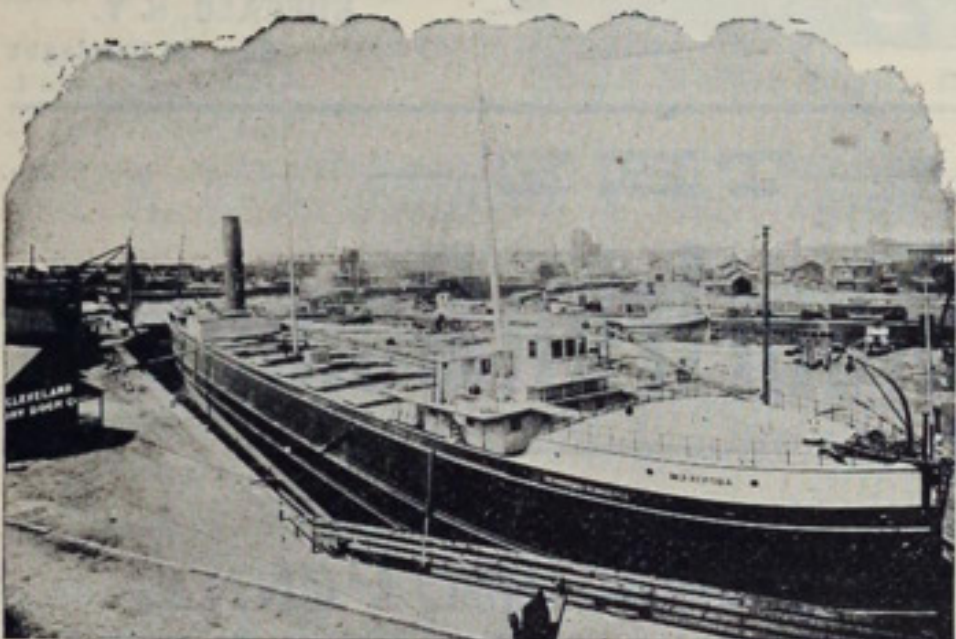
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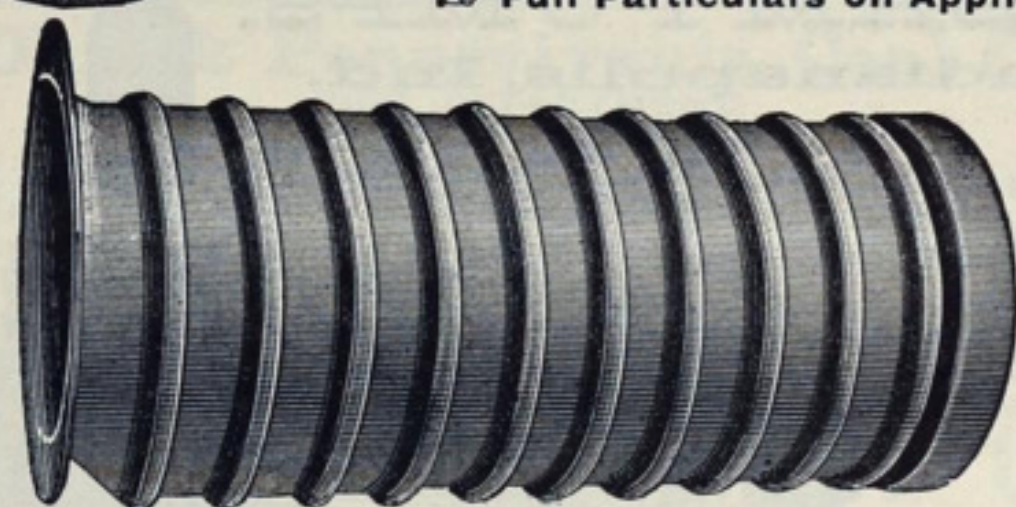


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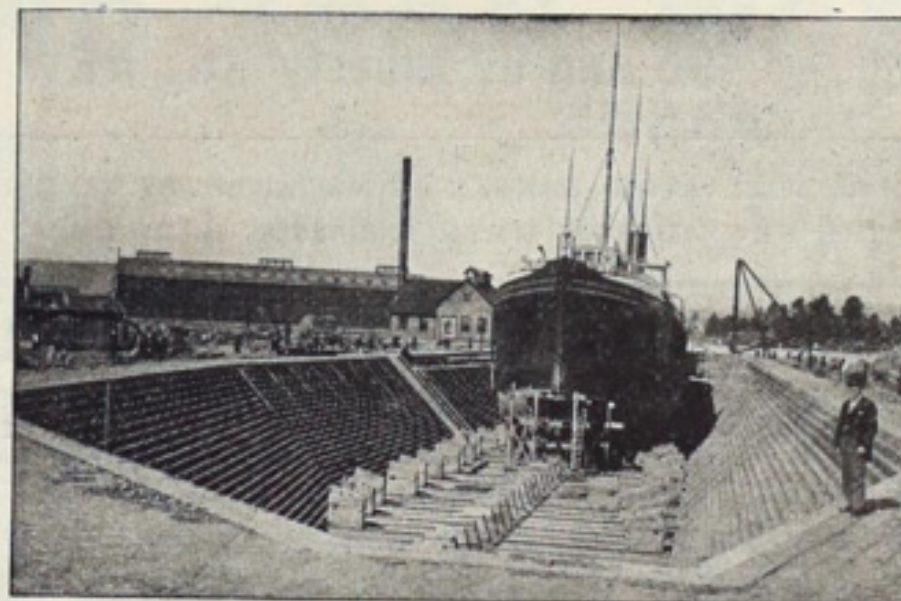
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